

# Histology of Endocrine System III

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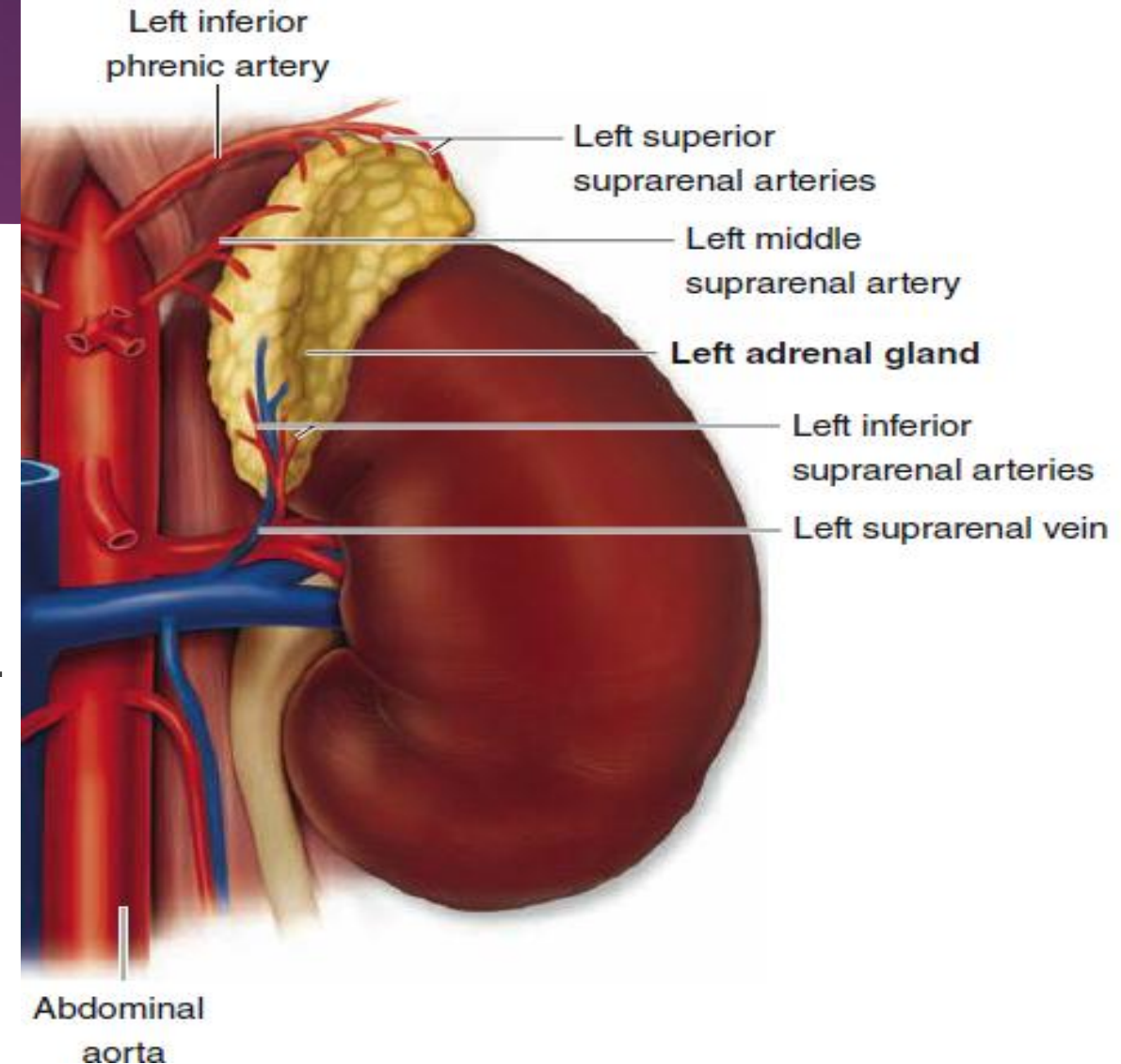


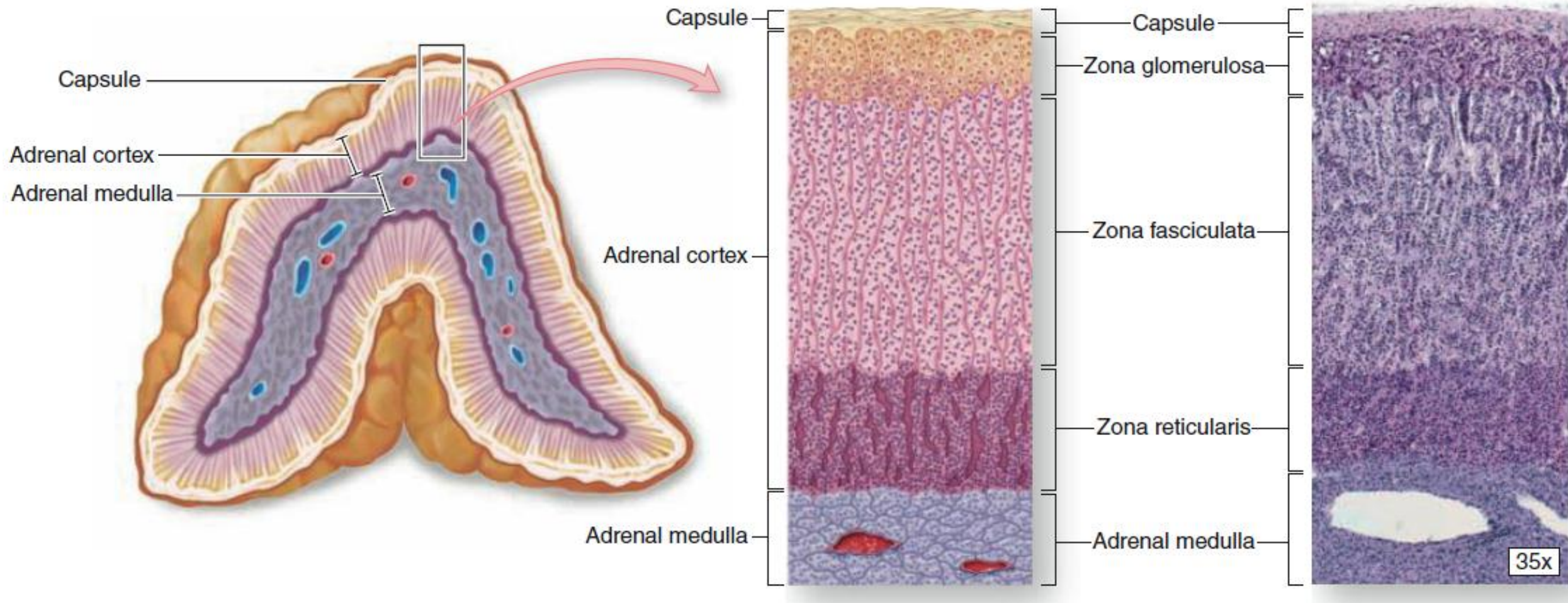
# Adrenal Glands

The paired adrenal glands are located at the superior pole of each kidney.

Each consists of an outer cortex that produces a variety of steroid hormones, and an inner medulla that produces epinephrine and norepinephrine.

**FIGURE 20–12** Location and blood supply of the adrenal glands.





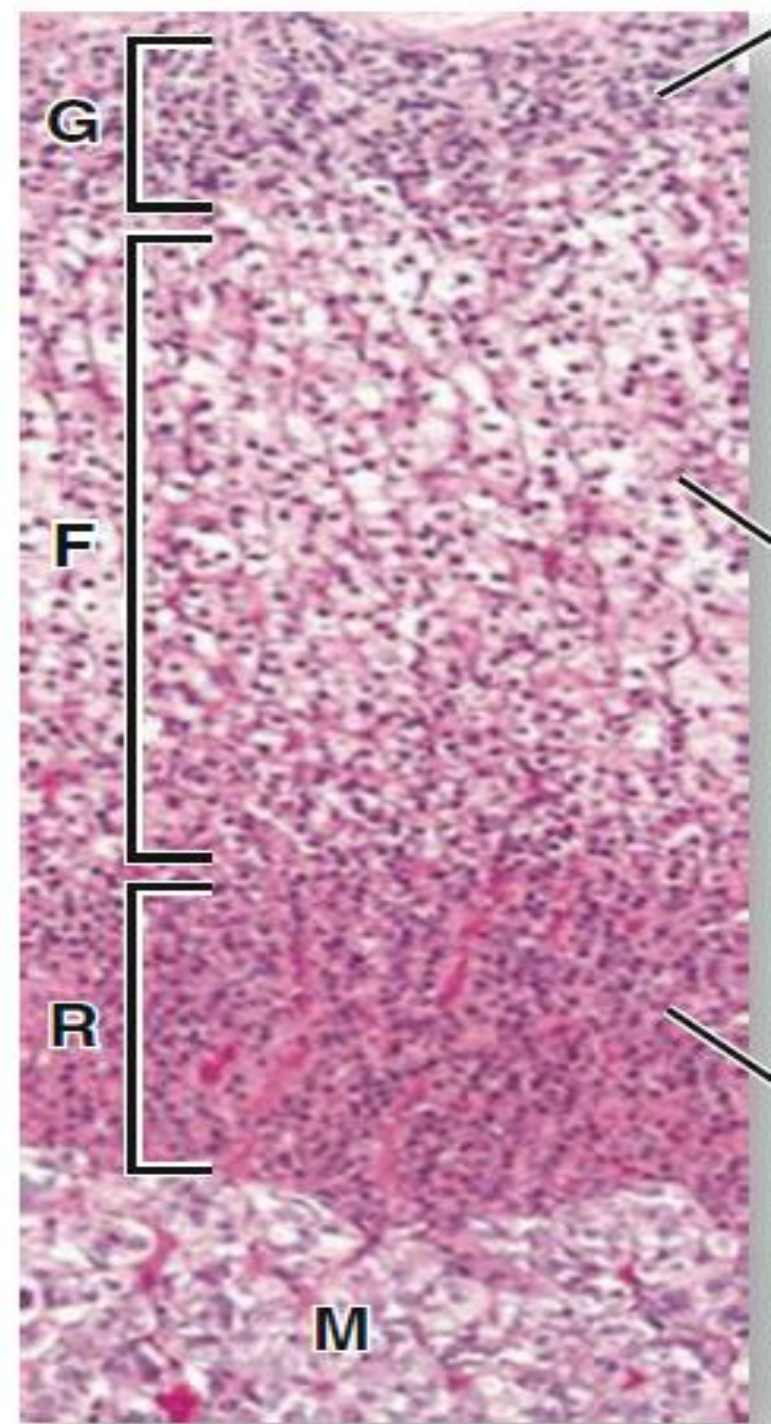
Inside the capsule of each adrenal gland is an adrenal cortex, formed from embryonic mesodermal cells, which completely surrounds an innermost adrenal medulla derived embryologically from neural crest cells.

Both regions are very well vascularized with fenestrated sinusoidal capillaries.

Cortical cells are arranged as three layers: the zona glomerulosa near the capsule, the zona fasciculata (the thickest layer), and the zona reticularis.

# 1. Adrenal Cortex

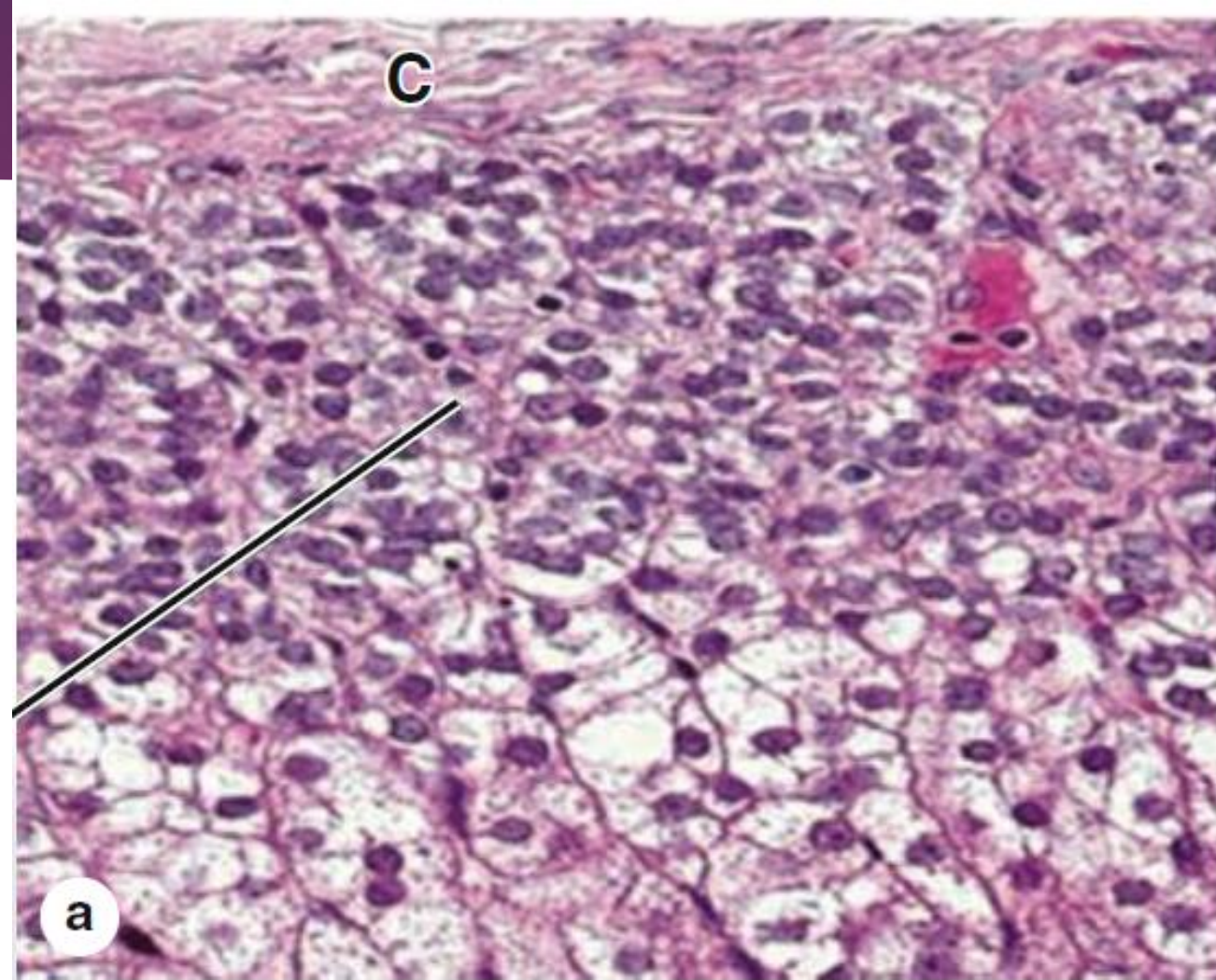
- ▶ The **adrenal cortex** consists of three concentric zones, all histologically distinct but with cells producing steroid hormones and all drained by the same system of capillaries.
- ▶ The most superficial **zona glomerulosa** has round clusters of cells producing **mineralocorticoids** such as **aldosterone** regulating electrolyte levels.
- ▶ The wider, middle **zona fasciculata** has elongated strands of cells producing **glucocorticoids** such as **cortisol**, which regulates several aspects of carbohydrate metabolism.
- ▶ The innermost **zona reticularis** has a network of cells making the **weak androgen dehydroepiandrosterone (DHEA)** that is converted to testosterone in men and women.



# Zona Glomerulosa

Immediately beneath the capsule (**C**) which is fibroelastic, the **zona glomerulosa** is the outer most and narrow zone. consists of deeply staining, densely packed nuclei, and rounded clusters of columnar or pyramidal cells principally secreting the mineral corticoid aldosterone.

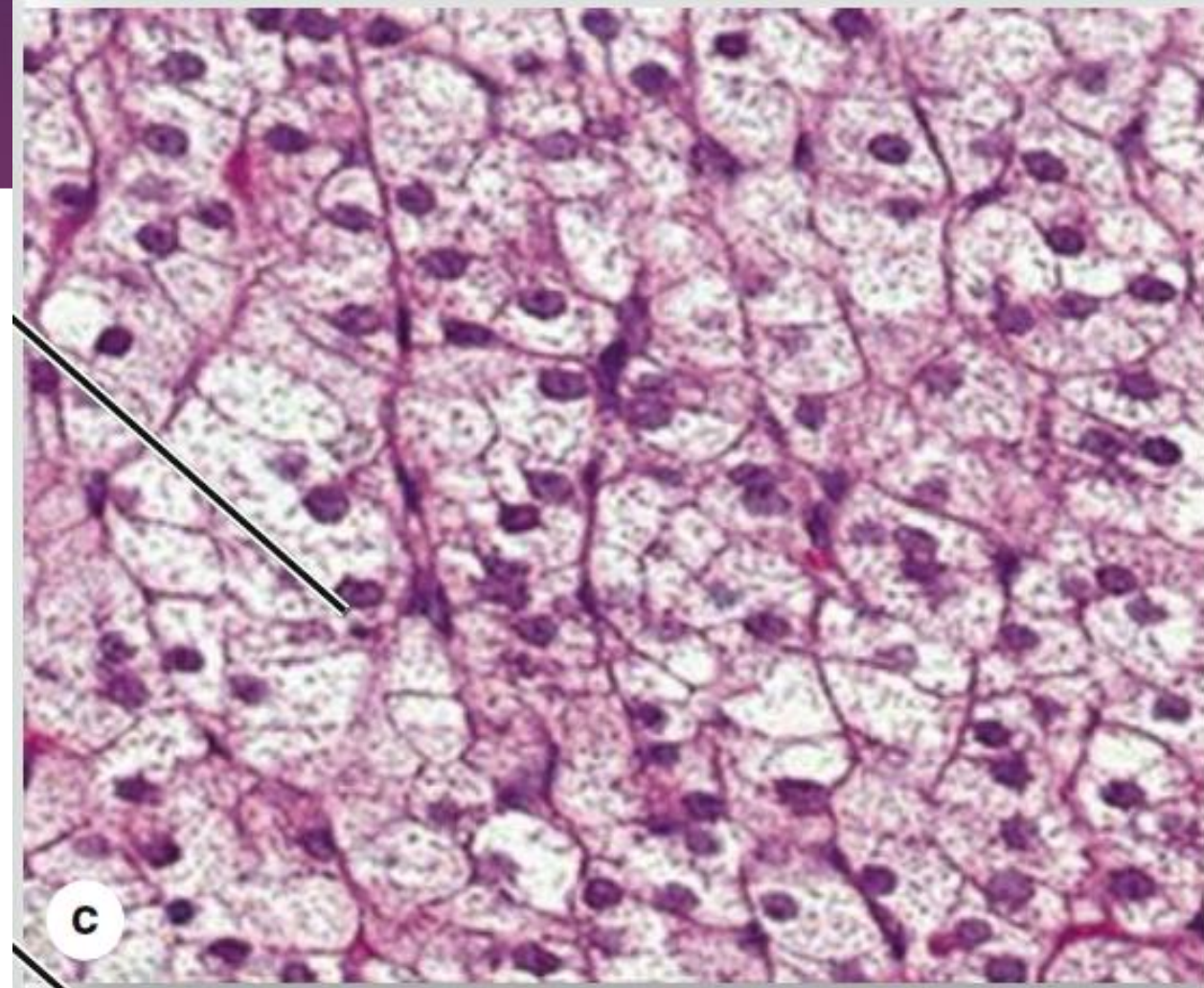
Stain: H&E



# Zona Fasciculata

The thick middle and the broadest layer, the **zona fasciculata**, consists of long cords of large, spongy-looking cells mainly secreting glucocorticoids such as cortisol.

Stain: H&E

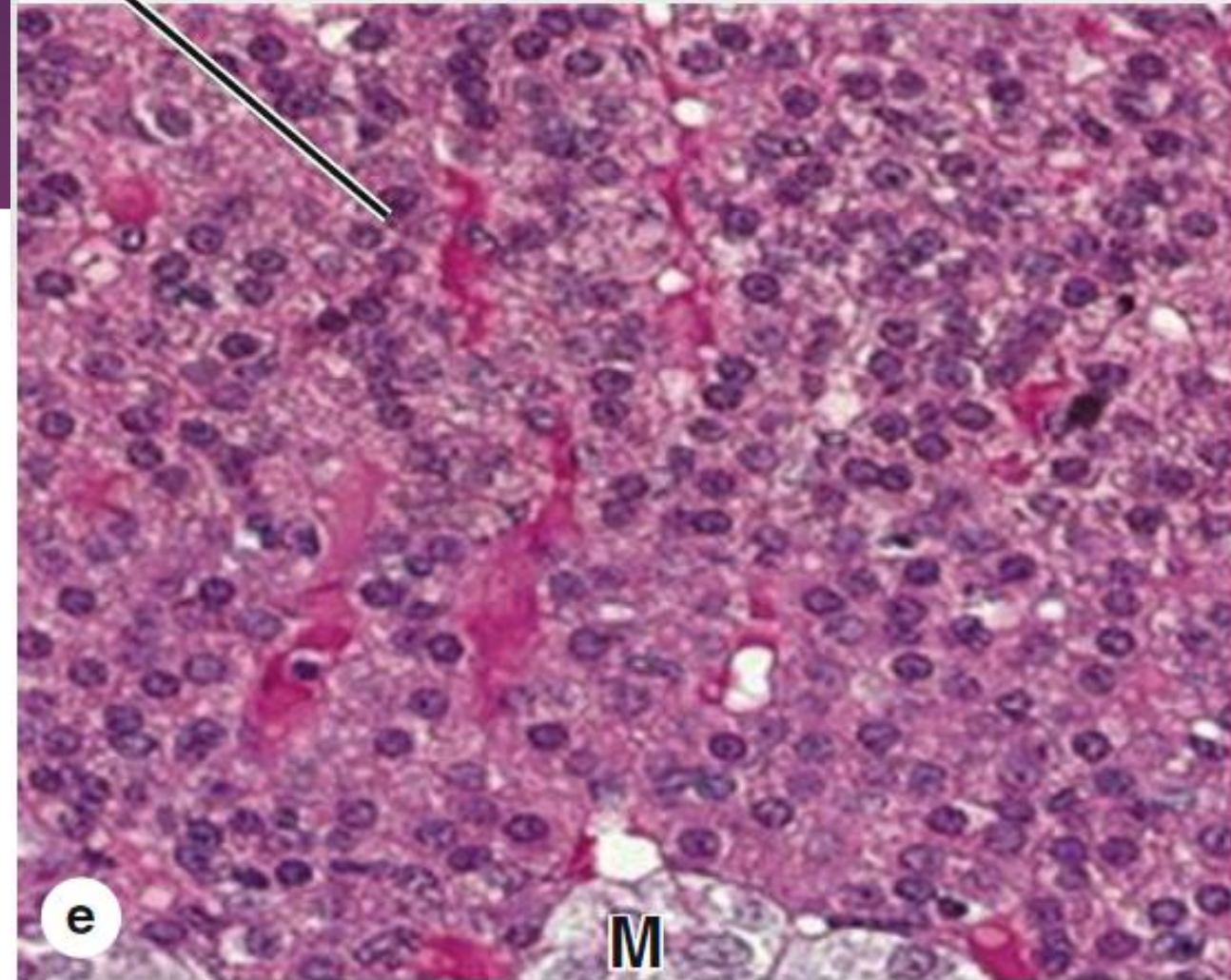


# Zona Reticularis

Cells of the innermost **zona reticularis**, next to the medulla (**M**), are small, have fewer lipid droplets and are therefore better stained, arranged in irregular cords separated by sinusoid arranged in a close network and secrete mainly sex steroids, including the androgen precursor DHEA.

Cells of all the layers are closely associated with capillaries and sinusoids.

Stain: H&E

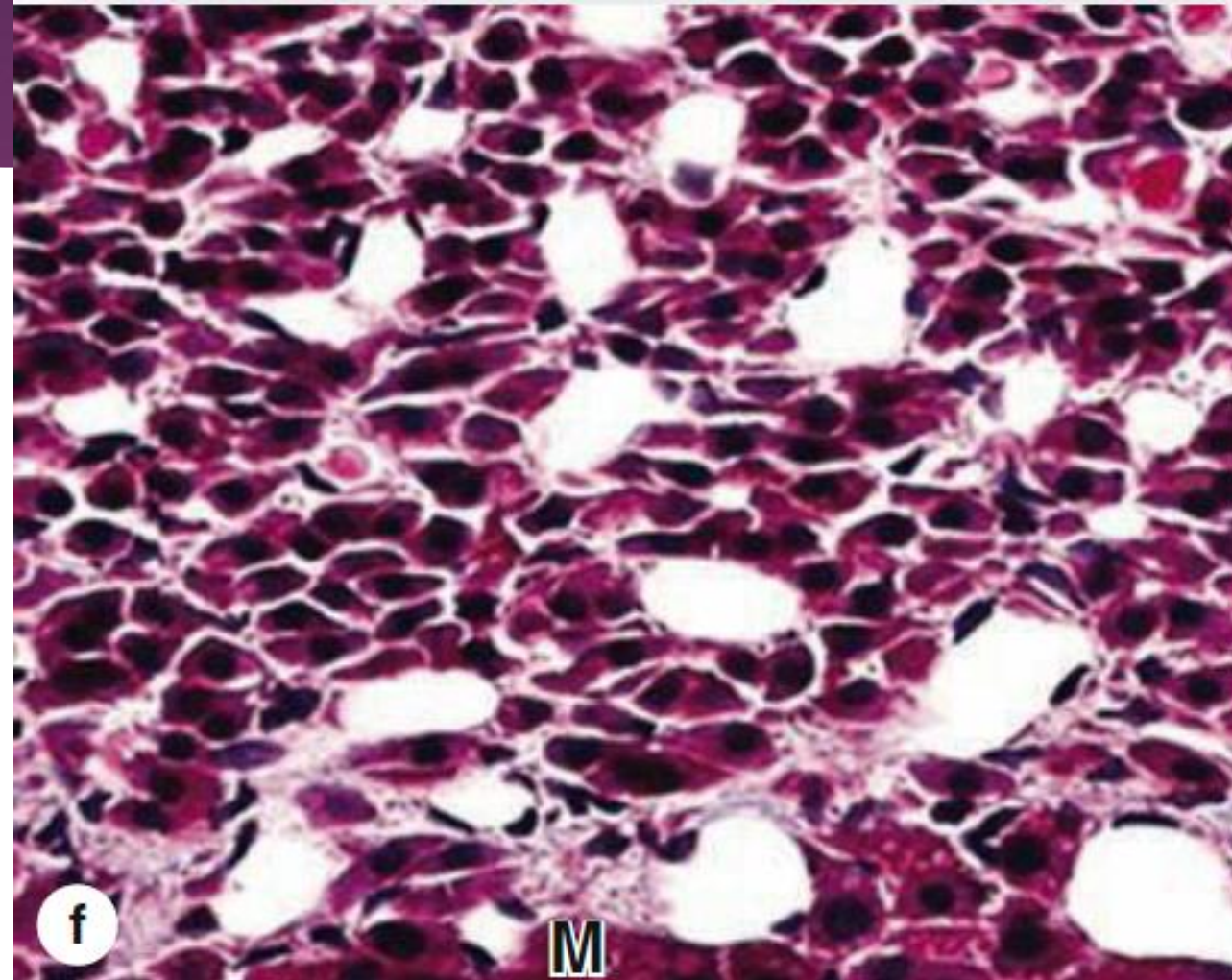


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Stain: Mallory trichrome.



## 2. Adrenal Medulla

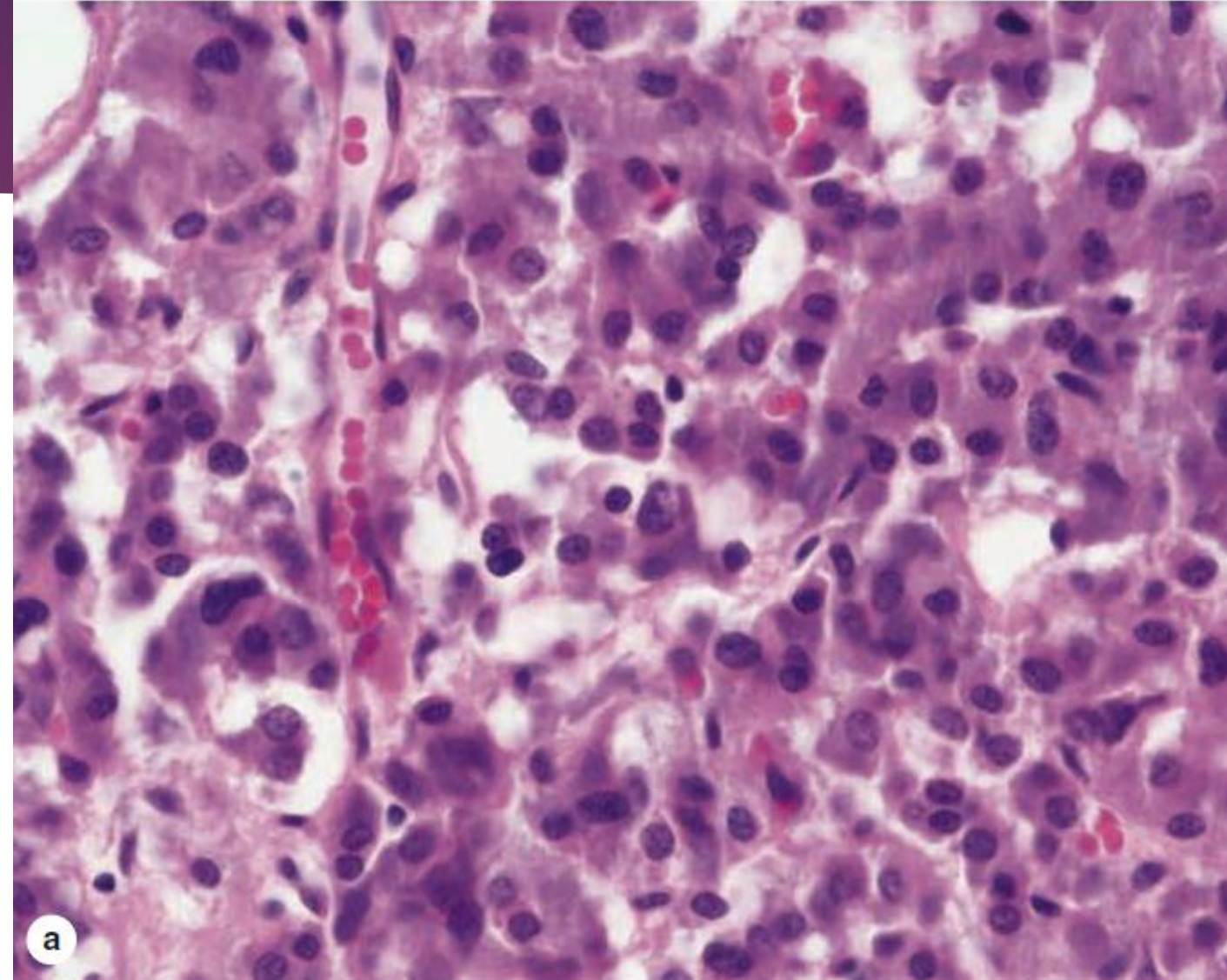
- ▶ The **adrenal medulla** contains neural crest-derived **chromaffin cells** synthesizing either **epinephrine** or **norepinephrine** that regulate the stress response.

# Adrenal Medulla

The micrograph shows that chromaffin cells are large pale-staining cells, arranged in cords interspersed with wide capillaries. Faintly stained cytoplasmic granules can be seen in most chromaffin cells.

Stain: H&E

FIGURE 20-16 Adrenal medulla.



# Pancreatic Islets

- ▶ **Pancreatic islets of Langerhans** are small clusters of pale cells embedded within the exocrine tissue; they have primarily  **$\beta$  cells making insulin**,  **$\alpha$  cell (glucagon)**, and  **$\delta$  cells (somatostatin)**, PP cells making pancreatic polypeptide.

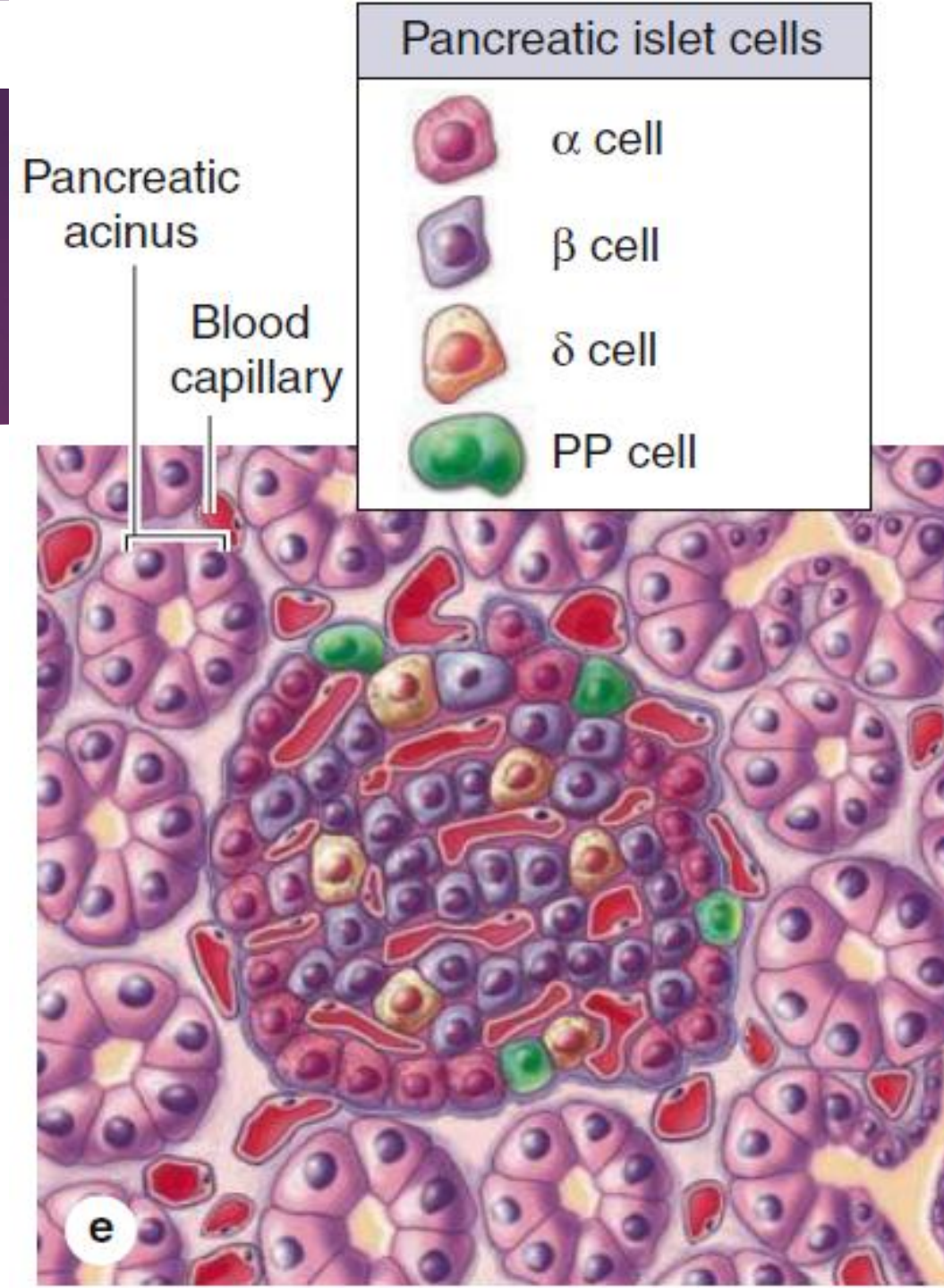




TABLE 20–4

Major cell types and hormones of pancreatic islets.

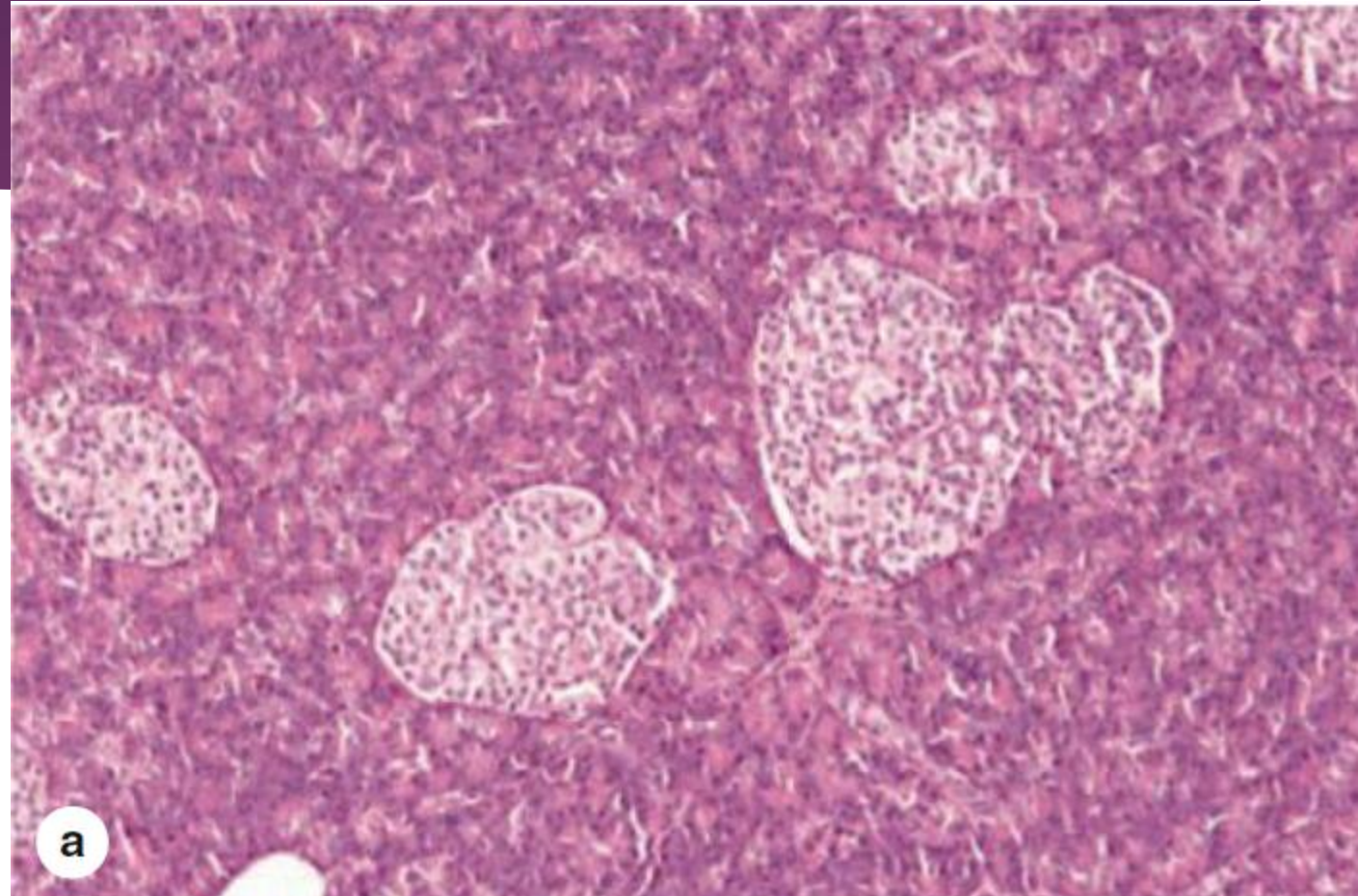
| Cell Type     | Quantity (%) | Hormone Produced       | Hormone Structure and Size                                          | Hormone Function                                                                                                                                                               |
|---------------|--------------|------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $\alpha$      | ~20          | Glucagon               | Polypeptide; 3500 Da                                                | Acts on several tissues to make energy stored in glycogen and fat available through glycogenolysis and lipolysis; increases blood glucose content                              |
| $\beta$       | ~70          | Insulin                | Dimer of $\alpha$ and $\beta$ chains with S-S bridges; 5700-6000 Da | Acts on several tissues to cause entry of glucose into cells and promotes decrease of blood glucose content                                                                    |
| $\delta$ or D | 5-10         | Somatostatin           | Polypeptide; 1650 Da                                                | Inhibits release of other islet cell hormones through local paracrine action; inhibits release of GH and TSH in anterior pituitary and HCl secretion by gastric parietal cells |
| PP            | Rare         | Pancreatic polypeptide | Polypeptide; 4200 Da                                                | Stimulates activity of gastric chief cells; inhibits bile secretion, pancreatic enzyme and bicarbonate secretion, and intestinal motility                                      |

# Pancreatic Islets

Pancreatic islets are clumped masses of pale-staining endocrine cells embedded in the exocrine acinar tissue of the pancreas.

The islets are clusters of cells smaller and lighter staining than cells of the surrounding tissue.

Stain: H&E

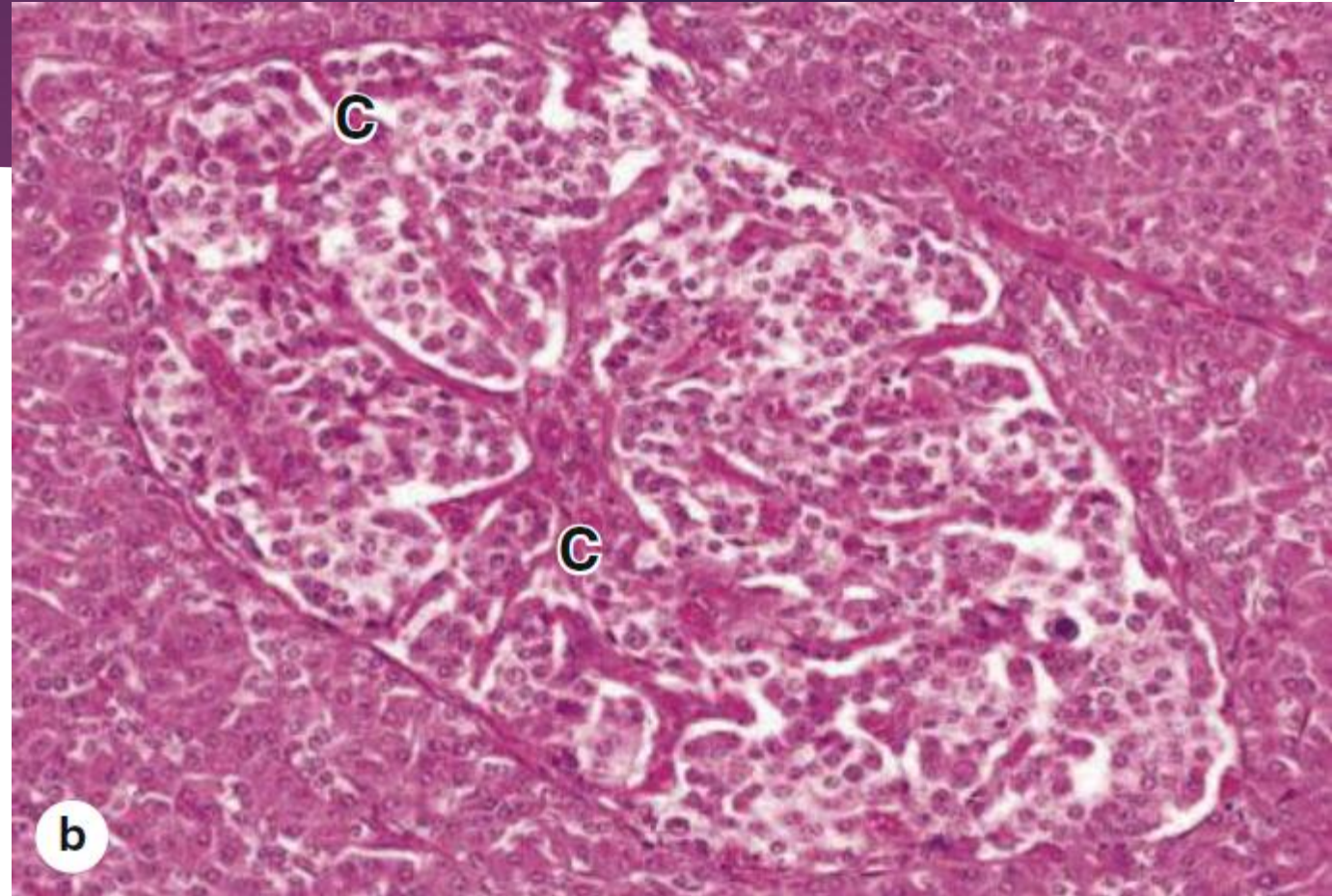


# Pancreatic Islets

At higher magnification an islet's capillary system can be seen.

Several arterioles enter each islet, branch into fenestrated capillaries (**C**) among the peripheral islet cells, then converge centrally before leaving the islet as efferent capillaries carrying blood to the acini surrounding the islet.

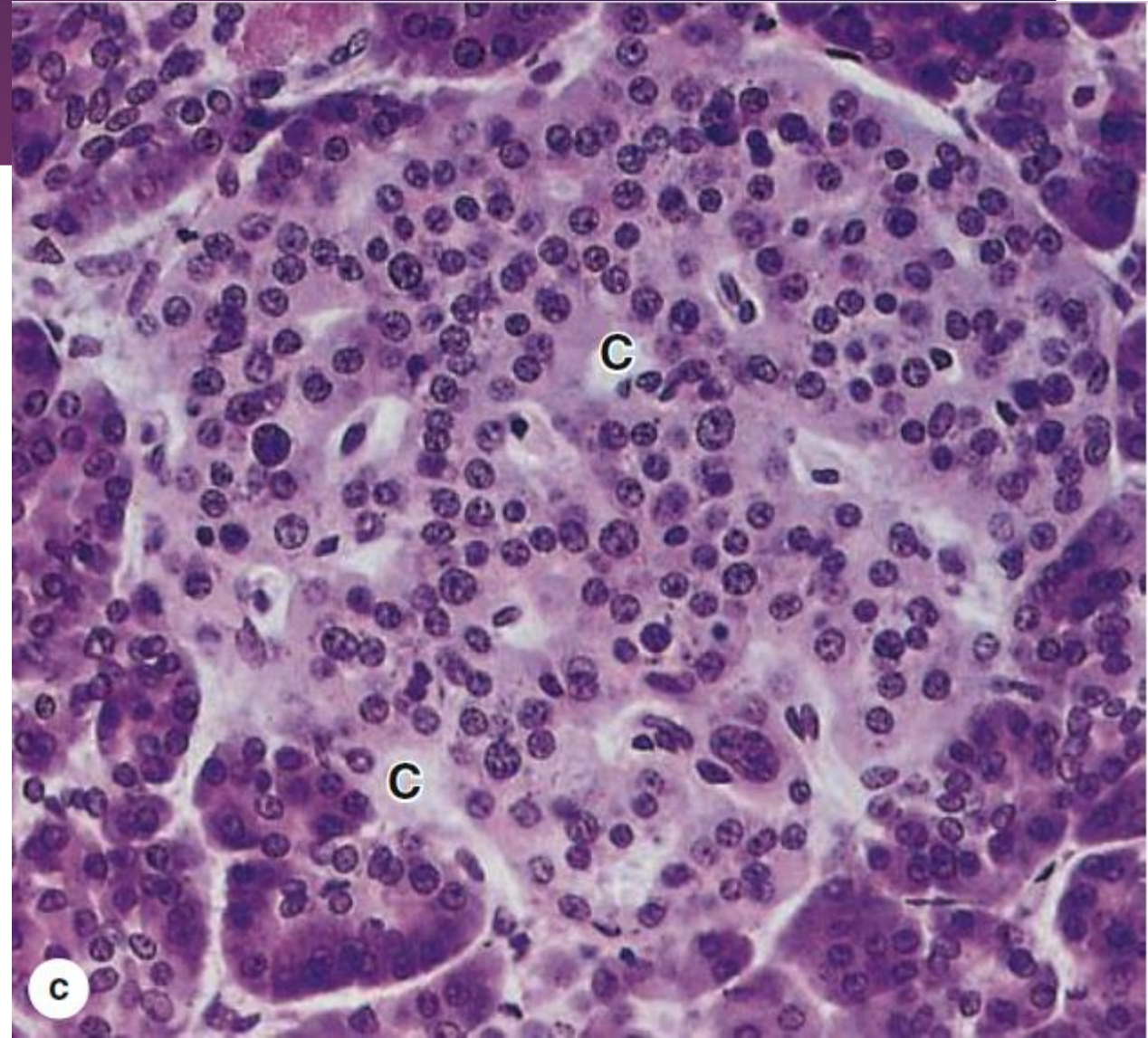
Stain: H&E

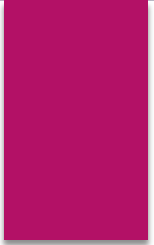


# Pancreatic Islets

With H&E staining all cells of an islet appear similar, although differences in cell size and basophilia may be apparent. Capillaries (**C**) are also apparent.

Stain: H&E





Thank you..